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TEST ANXIETY AS A MODERATOR IN
THE PREDICTION OF SCHOOL ACHIEVEMENT
FROM MEASURED ABILITY

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Psychology

by
Gina Lea Robinson
June 1995

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Approved by:


Frederick Newton, Chair, Psychology


Sanders McDougall


Gerard Saucier

5/19/95
Date

ABSTRACT

Test anxiety was measured in elementary school students (ages 9-12) via the Test Anxiety Scale for Children (TASC) and a heart rate monitor in an attempt to identify and measure characteristics of test anxiety that are related to a discrepancy between a student's predicted ability and school achievement. Ability was predicted by the Wechsler Intelligence Scale for Children-Third Edition (WISC-III), and achievement was estimated by the Iowa Test of Basic Skills (ITBS). There was a significant negative correlation between the TASC and both the WISC-III and ITBS; heart rate, however, did not correlate significantly with either of these measures. These results suggest that those higher in ability/achievement report (via TASC) lower amounts of anxiety. The direction of causality is discussed.

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I would not have made it this far in my education without the constant love, support, and encouragement of my family. My parents have instilled through example the qualities of patience and perseverance, and my sister has shown me how to enjoy the little things in life.

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INTRODUCTION

One of the fundamental goals of educational systems is to enable each student to perform at the level of his or her ability. A student's intellectual potential is often measured by an ability test in an effort to predict that child's school achievement. Many children, however, exhibit a discrepancy between ability and school achievement. When such a discrepancy is encountered, one is left to speculate about possible causal influences such as: lack of motivation/attention, specific learning disabilities, environmental constraints, brain deficits, or psychological factors. The purpose of this study was to investigate whether test anxiety moderates the relationship between measured ability and school achievement.

In order to better understand the notion of a discrepancy between ability and achievement, one must have a general understanding of what is meant by the concept of "intelligence" and how the student's potential is assessed. A useful framework was provided by Vernon (1969), who described and extended Hebb's (1966) classifications of intelligence. Intelligence A refers to the amount of intellectual potential an individual is born with. Intelligence B represents observed behavior resulting from an interaction of innate capacity and the environment.

Intelligence C refers to the results obtained on an intelligence test.

The development of factor-analytic methods led to many theories of intelligence. A widely accepted model of intelligence is Spearman's (1927) two-factor theory. He argued that what intelligence tests were really measuring was a general factor (g) combined with specific factors (s). Thorndike (1927) conceptualized intelligence as three clusters of ability: social, concrete, and abstract. Vernon (1950) incorporated Spearman's "g" into his hierarchical theory. Similar to a pyramid, this theory states that general intellectual ability "g" is hierarchically located above two factors, Verbal-Educational and Practical-Mechanical-Spatial, which are further divided into subordinate factors. Cattell (1963) is noted for his differentiation of fluid and crystallized intelligence. Similar to Intelligence A, fluid intelligence refers to a basic capacity for learning that is independent of education and experience. Crystallized intelligence, like Intelligence B, is the knowledge that results from an individual's interaction with the environment. One of the most recent theories that is consistent with the idea of crystallized intelligence was developed by Sternberg (1986, 1988) who described intelligence as "mental activities involved in purposive adaptation to, shaping of, and selection of real-world environments relevant to one's life"

(p. 33). Diverse theoretical views tend to converge on the idea that intelligence is a resultant property of an interaction between an individual's innate capacity and experience with the environment.

Many measures attempting to quantify intelligence have been developed. Binet and Simon (1905) brought "intelligence" into the classroom by developing a measure to predict academic performance. Several other measures (e.g., Kaufman Assessment Battery for Children, K-ABC, Kaufman & Kaufman, 1983; Raven Progressive Matrices, RPM, Raven, 1986) have been created to assess children's intelligence and are based on the previously mentioned theories. One measure of intellectual ability, the Wechsler Intelligence Scale for Children (WISC-R, Wechsler, 1974), is commonly used in schools due to ease of diagnosis and economical administration while still maintaining a good level of reliability and validity (Jenkins, 1979). Wechsler defined intelligence in terms of "purposefulness, rationality, and the ability to deal effectively with the environment" (Sattler, p. 14, 1974). Scores for the WISC-R are computed by combining the verbal and performance subscores into an overall score that is similar to Spearman's "g".

In dealing with scores from intelligence tests such as the WISC-R, it is important to keep in mind that IQ scores do not completely determine school achievement (Truch, 1989). Scores can be influenced by factors other than

intellectual ability, such as cultural background, ability to understand the instructions and communicate responses, and fine motor control. After noting the variability of scores reported in longitudinal studies, Bloom (1964) referred to intelligence as a developmental concept and stressed the importance of using multiple sources of information in making decisions for young children. He did indicate, however, that once the attribute was stabilized, it would be difficult to modify it greatly.

Despite their limitations, intelligence scores are, nevertheless, very useful in providing educators with a rough estimate of overall potential and assisting them in decisions of how to best educate the student. For example, many definitions of learning disability include a criteria of a discrepancy between ability and school performance (Truch, 1989). Vernon (1969) stated that intelligence tests provide a better estimate of potential than other measures of achievement. Measures of intelligence can be administered individually or to a group of students. Butcher (1968) argued for the use of individual tests rather than group testing because they "adequately predict scholastic achievement, yield a more useful picture of cognitive development than do group tests, and aid in clinical situations" (Sattler, 1974, p. 23).

School achievement refers to the student's actual performance on tests of material learned in the classroom.

It is often measured by a standardized test or the student's grades. When a child seems to be falling behind in classroom performance, it may be useful to obtain an estimate of that child's potential intellectual capacity to be compared with his/her achievement. If a sufficient amount of discrepancy exists between ability and achievement, one should further test and look for possible explanations. First, one should rule out the possibility of inadequacy of the tests for that particular student, for reasons such as cultural bias or insufficient knowledge of the English language. Then the student should be examined for learning and/or physiological disabilities like a visual deficit. If these are ruled out, it may be possible that the specific demands of the classroom environment combined with the student's own psychological processes (i.e., interpretation of environmental demands) create a state of anxiety.

As with theories of intelligence, theories of test anxiety have been refined over the years. Mandler and S. Sarason (1952) developed the first theory of test anxiety. This theory described test anxiety as a drive that could lead to one of two types of responding--task relevant or task irrelevant. Task relevant responding refers to focusing solely on the processes necessary for completing the task. Those who respond in a task irrelevant manner divide their attention between the task and thoughts about

how well they are doing (e.g., failure on a test, time limits). These distractions interfere with the completion of the task. This conceptualization led to the development of the Test Anxiety Questionnaire (TAQ, Mandler & Sarason, 1952) and, to date, over forty years of research. The TAQ was revised by I. Sarason into the Test Anxiety Scale (TAS, Sarason, 1958) , 21 items with a true-false format that focus on personality characteristics of test anxiety. This measure was further revised for use with children. The Test Anxiety Scale for Children (TASC, Sarason, Davidson, Lighthall, & Waite, 1958) provides an anxiety score which is determined by the total number of yes responses on a 30-item questionnaire. Sarason et al. (1958) reported a split-half reliability coefficient of .88 and an alpha coefficient of .88 for their validation sample.

In an analysis of research and theories of test anxiety, most focus on one or more of the following variables: situation, person, interaction of situation and person, and response. By definition, test anxiety refers to an evaluative situation. The nature of the evaluative situation may be more complex than just taking a test. Beidel (1988), for example, demonstrated that the presence of peers as well as being evaluated via a test can influence physiological responding.

An important distinction has been made between trait and state anxiety. Trait anxiety refers to a predisposition

to perceive an evaluative situation as personally threatening. There are relatively stable individual differences in the intensity and frequency of such a reaction. The trait variables of interest for test anxiety research are usually those of an individual's perception of an emotional threat regardless of the objective danger (Spielberger, 1972). In other words, the individual must define the situation as stressful (e.g., evaluative). The TASC is a widely used measure of trait anxiety. State anxiety refers to a temporary emotional reaction that is characterized by apprehension and activation of the autonomic nervous system; it varies from one situation to another (Spielberger, Gorsuch, & Lushene, 1970). State anxiety represents the interaction of situation and person variables. Cannon's (1936) studies of emotional stress provided evidence for autonomic nervous system arousal which consisted of increased heart rate, respiration, and skeletal muscle tone while reducing blood flow to the skin and viscera. Physiological measures have been useful indicants of state anxiety. According to Spielberger (1972), the interaction of an evaluative situation and the student's perception of a particular test as personally threatening determines the magnitude of anxiety state response.

Response variables are often measured by performance on a particular test. Hunsley (1985) demonstrated that individuals high in test anxiety obtained lower exam grades

than those with a low level of test anxiety. This does not necessarily mean that individuals who have a high level of test anxiety have a lower intelligence level, but that their attention to internal concerns rather than the test may interfere with performance on the test (Sarason, 1957; Watson & Friend, 1969; Wine, 1982). Endler (1975) provides a very useful integration of the previously mentioned variables. He states,

"Anxiety has been conceptualized as a stimulus variable (e.g., induced by situational threat), an intervening variable (e.g., a relatively stable personality trait or a drive), and a response variable caused by a situation by person interaction (e.g., emotional-affective reaction pattern and/or state anxiety)" (Endler, 1975, p. 148).

School achievement is not always at the level that is predicted by a student's measured ability. If a measure of intelligence is going to be used as the criterion against which one compares a student's level of performance, one must consider the many variables that are involved in this ability-achievement relationship. Test anxiety seems to play an important role in many students whose school achievement is not up to their predicted ability level.

The aim of this research was to identify and measure characteristics of test anxiety that are related to a discrepancy between a student's predicted ability and school achievement. The traditional approach to studying the relations between an individual's level of anxiety and performance has been to compare one type of test anxiety

(i.e., state or trait) to one type of performance (i.e., ability or achievement) (e.g., Gjesme, 1982; Fincham, Hokada, & Sanders, 1989). Many studies also select individuals who are at the extremes, high and low scoring individuals, on a test anxiety distribution (e.g., Beidel, 1988) or use a dividing point to determine test-anxious and nontest-anxious subjects (e.g., Hunsley, 1985). This study will examine the entire distribution to prevent regression-to-the-mean effects and to take full advantage of the variability obtained by these continuous measures. In order to evaluate state/trait differences, the present research used both a measure of the student's predisposition to be anxious in an evaluative setting and a measure of his/her reaction during an actual evaluation. There were also two measures of performance: an intelligence test to measure ability and achievement test scores.

REVIEW OF LITERATURE

Research on test anxiety has focused on factors that are related to differences in ability and/or achievement scores. There is a lack of consensus about whether these factors are state or trait dependent. As mentioned earlier, test anxiety has been hypothesized to account for decrements in performance on both measures of ability and school achievement. Presented here are selected studies that address these issues.

Ability and Test Anxiety

There is much disagreement concerning whether test anxiety is related to measured ability. After reviewing evidence for the relations between test anxiety and intelligence, Heinrich and Spielberger (1982) reported that several studies demonstrate small to moderate negative correlations (e.g., Flynn & Morgan, 1966; Klein, Fredericksen, & Evans, 1969), while others fail to find a significant relationship (e.g., Doyal & Forsyth, 1972; Greenberger, O'Connor, & Sorensen, 1971). More recently, Gjesme (1982) concluded that there is a relation between test anxiety and measured ability. This study included 507 sixth grade students. Test anxiety was measured by the TASC and ability was measured by a group test of problem solving. Subjects were divided into three groups based on ability

test scores (i.e., high-, moderate-, and low-ability). Results indicated that students in the low range of measured ability scored significantly higher on a test anxiety measure than those high in ability. One should be aware of the direction of causality issue when reviewing such studies. Low ability individuals may be more anxious about being evaluated; conversely, an individual might score lower on an ability measure because they are anxious about being evaluated.

Achievement and Test Anxiety

The results from studies of the relations between test anxiety and measured achievement are also somewhat ambiguous. Hunsley (1985) found a significant negative correlation in a sample of 62 college students taking a statistics course. This study employed both a state and a trait measure of anxiety as well as students' reports of how they felt while taking each statistics exam. Hunsley concluded that highly test anxious students obtain lower grades than do non-test anxious students. Test anxiety accounted for approximately 10% of the variance in exam grades (i.e., Exam 1 $r = -.29$, Exam 2 $r = -.08$, Exam 3 $r = -.30$, Exam 4 $r = -.33$, $p < .05$).

Fincham, Hokoda, and Sanders (1989) failed to find a significant test anxiety-achievement relation. The sample in this study consisted of 87 third graders. The

researchers examined the relation of test anxiety and school achievement (both concurrent and future) over a two-year period. Measures used were a 7-item measure of test comfort, report card in third grade, and an achievement test in fifth grade. Results obtained from an alpha coefficient and path analysis did not reveal a significant relation even at the .08 level of significance-- $r=+.13$ and $r=+.10$ for third and fifth grades respectively.

Possible explanations for the discrepancy between these two studies are differences in the measures of anxiety used and the age of the subjects. Intuitively, multiple measures of test anxiety should give a more accurate view than one 7-item questionnaire. Also, test anxiety may not have as strong of an influence on the school achievement in third graders as in college students. A developmental trend was found by Hill and Sarason (1966) who reported that the relation between test anxiety and achievement increases from close to zero in first grade to about $-.45$ in sixth grade.

Ability, Achievement, Gender, and Test Anxiety

In the few early studies that used both measures of ability and achievement, ability was usually used as a group selection variable (i.e., subjects were divided into high-, moderate-, and low-ability groups). Feldhusen and Klausmeier's (1962) study examined the ability, achievement, and test anxiety of 120 fifth graders. Each subject was

assigned to one of three ability level groups based on his/her WISC-R score and then completed an anxiety scale and an achievement battery. Analyses revealed a significant negative correlation between anxiety and ability, and a significantly higher mean anxiety score for the low ability group. Both genders showed a similar pattern and size of correlations of test anxiety with ability and achievement measures; however, no such correlation was significant.

Two studies done by Gjesme (1971, 1972) revealed that test anxiety had differential effects on academic achievement depending on ability group and gender. He stated that test anxiety had the most negative influence on school achievement among boys with moderate abilities. Test anxiety had the most negative influence on performance among high-ability girls.

Psychophysiology and Test Anxiety

Very few studies of psychophysiological correlates of test anxiety have been published in the past twenty years. Holroyd and Appel (1980) concluded from their extensive literature review that no relationship had been demonstrated between test anxiety and tonic physiological activity. Beidel's (1988) study, however, provides evidence to the contrary. This study assessed autonomic responses of 8-12 year old children in two social-evaluative situations. First, the subjects were divided into high and low test

anxiety groups based on cutoff scores on the TASC. This prescreening anxiety measurement provided a relatively flat distribution. Next their heart rate (state anxiety) was measured during two tasks, a timed vocabulary test and an oral-reading session with other children present. The high test-anxious group maintained a constant heart rate elevation while the low anxiety group showed an adaptation response with an initial increase and then decrease to the baseline rate. These results suggest that there is a psychophysiological connection in test anxiety.

Previous research on the relations between test anxiety and ability/achievement has produced conflicting results. There is a general lack of agreement in the literature concerning the following issues: 1) to what extent test anxiety is related to ability and/or achievement, 2) the relative importance of state and trait anxiety, and 3) the existence of psychophysiological correlates of test anxiety.

The present study will attempt to overcome some of the limitations of earlier studies by using the entire distribution of subjects as opposed to earlier studies comparing one extreme to another (i.e., test anxious vs. non-test anxious). Additionally, two measures of anxiety as well as a variable of a discrepancy score will be utilized to enable a unique and more practical perspective on the issue of test anxiety. It is predicted that test anxiety

will moderate the nature of relations between ability and achievement.

HYPOTHESES

1. There will be an interaction between test anxiety and intelligence in the prediction of school achievement (i.e., test anxiety will weaken prediction of achievement from measured ability).
2. There will be a negative correlation between school achievement scores and test anxiety.
3. There will be a negative correlation between intelligence and test anxiety.
4. There will be a positive correlation between ability and school achievement.

METHOD

Subjects

Subjects were 9-12 year old children (n=67) who were in fourth through sixth grade at a middle- to lower-middle-class elementary school in Arizona. The ethnic breakdown of this sample was: 88% Caucasian, 8% Latino, 3% Native American, and 1% Indian.

Procedures

After obtaining approval by the CSUSB human subject research review committee and permission from the administration of the elementary school, letters were sent to all parents of fourth-sixth graders explaining the study and inviting their participation. A copy of that letter is included in Appendix A. Those who agreed to let their children participate were asked to return two consent forms, one indicating their understanding of the study and their willingness to participate (parental and child's signatures), and the second authorizing the school principal to provide a copy of the child's most recent basic skills test score. A copy of the consent forms is included in Appendix B.

Each student took part in a 90-minute session. These sessions were conducted at the students' school to avoid

anxiety that could potentially be induced by an unfamiliar setting. Half of the students completed the Test Anxiety Scale for Children (Appendix C) at the beginning of the session, and the other half completed the TASC at the end of the session to counterbalance for order effects. The TASC was used as a measure of trait anxiety with a minimum score of 0 representing low test anxiety and a maximum score of 60 representing high test anxiety. This 30-item questionnaire was scored by assigning a "yes" answer 2 points, "sometimes" 1 point, and "no" 0 points.

I administered subtests one through ten of the Wechsler Intelligence Scale for Children (Third Edition). Raw scores were used for all analyses. During the administration of the WISC-III, state anxiety was measured by a heart rate monitor (Lafayette, PU-701) placed on the student's index finger. Heart rate was only recorded during the baseline and the five verbal subtests because the movement required during the performance subtests prevented an accurate estimate of state anxiety. Fifteen readings were taken during the baseline and each subtest (a total of 90 readings).

All students in this study took the Iowa Test of Basic Skills (ITBS) within two months of this session. The ITBS is a commonly used group administered measure of school achievement. Each student's composite standard score was used for all analyses.

A hierarchical multiple regression analysis was selected due to the type of predictions and the correlational nature of the study. The regression equation was: $ITBS = WISC + TASC/heart\ rate + (WISC * TASC/heart\ rate)$. This indicates that ability (WISC), trait (TASC) or state (heart rate) test anxiety, and the interaction of ability with test anxiety/heart rate can be used to predict school achievement.

RESULTS

Descriptive statistics shown in Table 1 were all within the normal range. More specifically, all values were within three standard deviations of the mean; therefore, there were no univariate outliers. An analysis using Mahalanobis Distance showed no multivariate outliers at the .001 level. Missing values were removed in a pairwise manner. Data screening revealed a linear and normally distributed sample. Table 1. Descriptive Statistics.

VARIABLE	n	MEAN	SD
WISC	65	266.91	32.53
TASC	65	25.14	13.18
ITBS	64	123.29	16.18
HEART RATE	47	1.59	6.98

The intercorrelation matrices shown in Tables 2 and 3 helped to rule out the possibility of multicollinearity and singularity since the largest correlation between predictors was .67. The WISC-III scores were significantly related to ITBS scores. TASC scores were significantly and negatively related to both WISC-III and ITBS scores. Change in heart rate was not significantly correlated with any of the other variables.

Table 2. Intercorrelation Matrix--TASC.

	WISC	TASC	ITBS
WISC	----		
TASC	-.39*	----	
ITBS	.67*	-.44*	----

*p < .001

Table 3. Intercorrelation Matrix--Heart Rate.

	WISC	HEART RATE	ITBS
WISC	----		
HEART RATE	-.16	----	
ITBS	.62*	.11	----

*p < .001

In the hierarchical multiple regression, ability (WISC-III) scores, then test anxiety (TASC/heart rate) scores, and finally the interaction terms (WISC*TASC) were entered sequentially and tested for significance at their point of entry. This method of analysis was chosen so that the effects of IQ could be controlled, prior to the entry of TASC and the interaction term. Tables 4 and 5 show the increase in squared multiple correlations after the entry of each predictor with ITBS as the criterion. WISC-III scores

and TASC scores significantly contributed to explaining variance in ITBS scores ($R^2=.45$ and $.04$) respectively. Overall, the equation was significant, $F(3, 60)= 18.89$, $p<.001$.

Table 4. Hierarchical Multiple Regression--TASC.

VARIABLE	BETA	t	R ²
WISC	.558	2.59**	.45**
TASC	-.354	-.36	.04*
WISC*TASC	.136	.15	.0001

*p < .05 **p < .01

Table 5. Hierarchical Multiple Regression--Heart Rate.

VARIABLE	BETA	t	R ²
WISC	.65	5.59**	.38**
HEART RATE	.21	1.85	.05

*p < .05 **p < .01

DISCUSSION

Hypothesis 1, stating that there would be an interaction between test anxiety and intelligence in the prediction of school achievement was not supported by the regression equation. The impact of test anxiety does not change in relation to levels of ability. Test anxiety does, however, have a significant additive effect with ability in predicting achievement as shown by the significant change in R^2 ($R^2 = .04$). The WISC-III and ITBS are highly but not perfectly correlated. Scores on the TASC, with negative beta weights, help to account for and correct the discrepancy between measured ability and achievement.

Hypothesis 2, stating that there would be a negative correlation between achievement and test anxiety, was supported by the TASC scores, but not by the heart rate measure. Similarly, Hypothesis 3, stating that there would be a negative correlation between intelligence and test anxiety, was only supported by the TASC scores. This suggests that trait anxiety is more closely tied to decrements in performance on ability and achievement measures than state anxiety. It could also mean that heart rate is measuring variation extraneous to anxiety. Students who scored highly on the Test Anxiety Scale for Children reported that they were aware of being anxious in a testing situation, an awareness that most likely interferes with performance in an evaluative setting. This is not to say

that heart rate does not increase in an evaluative setting for some students. One could speculate that heart rate may increase in an evaluative setting but the student is not consciously aware of it and therefore is not distracted from the task at hand.

The correlations revealed that, as predicted by Hypothesis 4, WISC-III (ability) scores were positively related to ITBS (achievement) scores. This was not surprising since several of the cognitive skills required for the WISC-III overlap with those for the ITBS (e.g., general knowledge, verbal ability, spatial ability). TASC (trait anxiety) scores were negatively related to ability and achievement (see also Feldhusen & Klausmeier, 1962; Flynn & Morgan, 1966; Gjesme, 1971, 1972, 1982; Hill & Sarason, 1966; Hunsley, 1985; Klein, Fredericksen, & Evans, 1969). The direction of causality issue should be considered when reviewing these correlational statistics. As mentioned earlier, one is left to speculate about whether a student low in ability is more anxious about being evaluated, or the student may simply score lower on an ability measure because they are anxious about being evaluated.

A z-transformation was performed as a post hoc analysis to resolve one issue that surfaced during the course of the study. The results from two Gjesme (1971, 1972) studies indicate differential effects of test anxiety for

individuals with different levels of ability. The regression analysis is only sensitive to linear relationships. The WISC-III scores were converted to z-scores to overcome a possible curvilinear relationship. This transformation did not result in any appreciable differences compared to the non-transformed regression analysis. Therefore, this study did not show differential effects of test anxiety for individuals with different levels of ability.

A limitation of this study is the small sample size. The effect was large enough to be detected with this sample. If one would like to generalize the regression equation to other samples, however, more subjects are necessary to generate a more accurate equation. There is also a possibility that test anxiety could have had an effect on the WISC-III scores. Although there is a significant correlation between the WISC-III and TASC scores ($r = -.39$), any potential decrease in WISC-III scores would work against the predictions and therefore not increase the significance level.

The practical applications of the results of this study are primarily related to an educational setting and have implications for both educators and students. A large proportion of students who are evaluated by a school psychologist through intelligence testing are receiving this evaluation so that they can receive assistance if a

significant discrepancy between ability and performance is revealed. The TASC is a relatively simple way to assess the student's predisposition to perceive an evaluative situation as stressful. It can be completed in approximately ten minutes and can be administered verbally to students with reading difficulties.

The psychologist can readily determine to what extent test anxiety may be hindering performance and choose the appropriate assistance for that student. The beta weights can even be multiplied by the WISC-III raw scores and TASC (i.e., $ITBS\ raw = [WISC\ raw][beta] + [TASC\ raw][beta]$) to get an estimate of predicted performance on the ITBS achievement test. This knowledge can also help in the classroom by making educators more aware of factors other than intelligence that can affect performance. The teacher could reduce the use of time limits during evaluations and deemphasize the evaluative nature of the tests (Sarason, 1975) for students identified as being test-anxious.

The implication of these results for students is that it may be possible to increase performance by reducing test anxiety. Several techniques for reducing test anxiety have been effective. Wine (1971) reports that highly test-anxious subjects were helped by attentional training in which they were instructed to attend to task-relevant behavior. It often takes practice for students to become

skilled at ignoring distractions, such as sound and movement, and concentrate only on the test.

Techniques using relaxation are common treatments for test anxiety. Wolpe's (1969) systematic desensitization is used to train students to relax and experience increasingly more threatening situations. The student may begin by imaging an evaluative situation and work up to being able to relax in an actual testing situation. Jacobson's (1929) Progressive Muscle Relaxation technique is also very popular for reducing anxiety. The individual learns how to tighten and then relax isolated groups of muscles. This has been shown to be effective for many individuals.

Cognitive behavior modification incorporates the methods of systematic desensitization and cognitive therapy in which the student learns positive self-statements to repeat during the exam to maintain concentration. Training in study skills is also an important part of this treatment (Kaplan et al., 1979; Meichenbaum, 1972).

These techniques of attentional training and relaxation were combined to provide the students who participated in this study some simple tips for reducing test anxiety. Students wanting to reduce the anxiety that they may experience in the classroom are encouraged to practice these five steps: 1) Positive attitude which begins with preparation, 2) Relax using a quick version of Jacobson's technique, 3) Ignore noises and other distractions, 4) Deep

breaths--take three right before the test to focus attention and assist in relaxation, and

5) Expect to succeed. These steps can easily be remembered by using the acronym PRIDE. A more detailed copy of these tips is included in Appendix D.

This study has contributed to 40 years of research on test anxiety. In addition to replicating previous findings of negative correlations between test anxiety and ability/achievement individually, it extended previous research by examining the combined effect of measured ability and test anxiety in the prediction of school achievement. In order to develop a more accurate regression equation, future research should be done using a larger sample that is more geographically diverse. In conclusion, this study has contributed to the growing body of educational research and add one more step toward giving our children every chance possible to succeed.

APPENDIX A: LETTER TO PARENTS

Dear Parent:

I am writing to ask for your child's participation in a research study to be conducted at Fort Mojave Elementary School. The purpose of this study is to look at the possibility that test anxiety (worry) may interfere with the student's performance in the classroom. Participation will involve a session of approximately 90 minutes in which the child will complete an ability measure and a questionnaire that measures test anxiety. During these tests heart rate will be measured. I would also like parents' permission for Fort Mojave Elementary School to provide me with your child's most recent basic skills test score.

All of the information will be entirely confidential. All records will be assigned a research number that will prevent the identification of any individual person or family. All statistical analyses and any scientific report of the results of this study will deal with group data only in such a way that no individual person can be identified.

There are no physical risks to any of the participants in this study. Any possible anxiety or psychological stress encountered during the testing session should not exceed the level that your child experiences during his/her daily activities in school. Parents and students may withdraw from this study at any time. I will be available by phone to answer any questions you may have about this study. Please feel free to call me collect at (909) 880-2098 or leave a message and I will return your call. This study has been approved by the Human Subject Review Board, Department of Psychology, California State University, San Bernardino. The Psychology Department telephone number is (909) 880-5570.

The results of this study will help improve the understanding of how test anxiety influences a student's performance in school. Due to time limitations, I will not be able to work with all of the students at this school, but it is hoped that the results of this study will help the students become better test takers and help the educators become more sensitive to factors other than intelligence that influence school achievement.

Please discuss the nature of this study with your child. If you and your child are willing to participate in this study, please sign the enclosed consent form and also have your child sign the consent form where indicated. Return the forms to your child's teacher. Thank you for your consideration.

Sincerely,

Gina L. Robinson
Graduate Student in Psychology

APPENDIX B: CONSENT FORMS

CONSENT FORM 1

I have read and understood the description of the procedures and the purpose of this study of the effect of test anxiety on the prediction of school achievement from measured ability. I have been given the opportunity to ask any questions I have about the study and those questions have been answered fully and to my satisfaction. By signing below I agree to allow my child to participate in the study described above. I have been advised that I can withdraw at any time before the final analysis of the group data even if I have agreed to participate.

(Parent's Signature)

(Date)

(Student's Signature)

(Date)

I prefer that the 90-minute session take place:

___ before school ___ during school ___ after school

CONSENT FORM 2

Full Name of Child: _____

I authorize the principal of Fort Mojave Elementary School to release to Gina L. Robinson the most recent report card for the child named above.

(Parent's Signature)

(Date)

(Student's Signature)

(Date)

I would like a summary of results: ___ yes ___ no

If yes, send to: _____

APPENDIX C: TEST ANXIETY SCALE FOR CHILDREN (TASC)

1. Do you worry when the teacher says that she is going to ask you questions to find out how much you know?
2. Do you worry about passing from the sixth grade to the seventh grade at end of the year?
3. When the teacher asks you to get up in front of the class and read aloud, are you afraid that you are going to make some bad mistakes?
4. When the teacher says that she is going to call upon some boys and girls in the class to do math problems, do you hope that she will call upon someone else and not on you?
5. Do you sometimes dream at night that you are in school and cannot answer the teacher's questions?
6. When the teacher says that she is going to find out how much you have learned, does your heart begin to beat faster?
7. When the teacher is teaching you about math, do you feel that other children in the class understand her better than you?
8. When you are in bed at night, do you sometimes worry about how you are going to do in class the next day?
9. When the teacher asks you to write on the blackboard in front of the class, does the hand you write with sometimes shake a little?
10. When the teacher is teaching you about reading, do you feel that other children in class understand her better than you?
11. Do you think you worry more about school than other children?
12. When you are at home and you are thinking about your math lesson for the next day, do you become afraid that you will get the answers wrong when the teacher calls upon you?
13. If you are sick and miss school, do you worry that you will do more poorly in your schoolwork than other children when you return to school?
14. Do you sometimes dream at night that other boys and girls in your class can do things you cannot do?

15. When you are home and you are thinking about your reading lesson for the next day, do you worry that you will do poorly on the lesson?
16. When the teacher says that she is going to find out how much you have learned, do you get a funny feeling in your stomach?
17. If you did very poorly when the teacher called on you, would you probably feel like crying even though you would try not to cry?
18. Do you sometimes dream at night that the teacher is angry because you do not know your lessons?
19. Are you afraid of school tests?
20. Do you worry a lot before you take a test?
21. Do you worry a lot while you are taking a test?
22. After you have taken a test do you worry about how well you did on the test?
23. Do you sometimes dream at night that you did poorly on a test you had in school that day?
24. When you are taking a test, does the hand you write with shake a little?
25. When the teacher says that she is going to give the class a test, do you become afraid that you will do poorly?
26. When you are taking a hard test, do you forget some things you knew very well before you started taking the test?
27. Do you wish a lot of times that you didn't worry so much about tests?
28. When the teacher says that she is going to give the class a test, do you get a nervous or funny feeling?
29. While you are taking a test do you usually think you are doing poorly?
30. While you are on your way to school, do you sometimes worry that the teacher may give the class a test?

APPENDIX D: TIPS FOR REDUCING TEST ANXIETY

1) POSITIVE ATTITUDE

Positive attitude begins with preparation. The best way to prepare for a test is to overlearn the materials. In other words, do not wait until the night before the test to begin preparing.

2) RELAX

Practice these relaxation exercises at home:

(Based on Jacobson's progressive muscle relaxation)

First, scrunch up your face (like you just ate a lemon) for 5 seconds. Then relax these muscles for 5 seconds.

Tighten the muscles in your shoulders, arms, and chest for 5 seconds, then relax.

Finally, tighten every muscle in your legs and feet for 5 seconds. Now relax your whole body.

A quick way to do this before a test is to tighten all of your muscles while you count to ten then relax all of your muscles.

3) IGNORE NOISES

Once the test has started students are often distracted by sounds and movement that occur during a test. It is important to focus all of your attention on the test.

4) DEEP BREATHS

Take 3 deep breaths before you start the test.

5) EXPECT TO SUCCEED!

As Henry Ford once said, "Whether you think you can or not, you are right."

Each time you take a test or even just enter the classroom think of the word PRIDE.

P - POSITIVE ATTITUDE

R - RELAX

I - IGNORE NOISES

D - DEEP BREATHS (3)

E - EXPECT TO SUCCEED

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